Roll No. ....

Total No. of Questions – 7

Time Allowed – 3 Hours

MAY 2012

Total No. of Printed Pages – 12

Maximum Marks – 100

MCQ

Answers to questions are to be given only in English except in the case of candidates who have opted for Hindi medium. If a candidate has not opted for Hindi medium, his answers in Hindi will not be valued.

Question Number **1** is *compulsory*.

Answer any **five** out of the remaining **six** questions.

Working Notes should form part of the answer.

No statistical or other table will be distributed along with this question paper.

Graph sheet will be provided to candidates along with this paper.

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1. (a) A company has decided to launch a new product X which is expected to have a demand of 10,000 units during the year at ₹ 160 per unit. The following information is furnished by the company :

    (i) Material – The manufacture of one unit of X requires one unit of each of materials A, B and C.

Raw Material	Current Stock (Units)	Cost per unit (₹)		
		Original Cost	Current Purchase Price	Resale Value
A – Regularly being used	10,000	16	20	14
B – Old stock (Not in use)	6,000	28	24	8
C – New stock	–	–	48	–

5

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(ii) Direct labour

Skilled labour is paid at ₹ 80 per hour. It takes 0.25 hours/unit. Skilled labour has to be drawn from another production line which has a contribution of ₹ 240 per unit, with each unit requiring 2 hours of skilled labour.

Unskilled labour – 2 hours/unit @ ₹ 56 per hour. There is abundant unskilled labour in the factory, but according to an agreement with the labour union, no unskilled worker can be retrenched.

(iii) Variable overhead - ₹ 10 per unit.

(iv) Fixed Costs - no increase.

Using relevant cost approach, you are required to find out the average variable cost per unit of X.

(b) The following table gives the unit transportation costs and the quantities demanded/ supplied at different locations for a minimisation problem :

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Demand / Supply	C_1	C_2	C_3	C_4	Total Units
R_1	100	120	200	110	20000
R_2	160	80	140	120	38000
R_3	180	140	60	100	16000
Total Units	10000	18000	22000	24000	

You are required to find out which cell gets the 3rd allocation in the initial basic feasible solution under each of the following methods and to give the cell reference, cost per unit of that cell and the quantity allocated to that cell :

(i)   North West Corner Rule

(ii) Vogel's Approximation Method

(iii) Least Cost Method

(Candidates may use the standard notation of C_iR_j for cell reference.(e.g. C_2R_3 means the cell at the intersection of Column 2 and Row 3)

(Note : The full solution is not required to be worked out).

(c)   XY Ltd. makes two products X and Y, whose respective fixed costs are F_1 and F_2. You are given that the unit contribution of Y is one fifth less than the unit contribution of X, that the total of F_1 and F_2 is ₹ 1,50,000, that the BEP of X is 1,800 units (for BEP of X, F_2 is not considered) and that 3,000 units is the indifference point between X and Y.(i.e. X and Y make equal profits at 3,000 unit volume, considering their respective fixed costs). There is no inventory build up as whatever is produced is sold.

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You are required to find out the values of F_1 and F_2 and unit contributions of X and Y.

(d)   State whether each of the following independent activities is value-added or non-value-added :

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(i)   Polishing of furniture used by a systems engineer in a software firm.

(ii) Maintenance by a software company of receivables management software for a banking company.

(iii) Painting of pencils manufactured by a pencil factory.

(iv) Cleaning of customers' computer key boards by a computer repair centre.

(v)   Providing brake adjustments in cars received for service by a car service station.

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2. (a) AB Ltd. makes component 'C' and billing machines. Division A makes   **10**
          component 'C' that is used in the final assembly of the machine in Division B.
          (One unit of Component 'C' is used per machine). Component C has an outside
          market also. A and B operate as profit centres and each can take its own
          decisions. The following data is given in the existing scenario for Divisions A
          and B, under which Division A has enough special and external demand to use
          its capacity and hence is offering B rates of 800 ₹/unit for quantity up to 750
          units and 900 Rs/unit for more than 750 units, so that its outside contribution is
          not affected by transfers to B. A and B can sell any quantity up to the
          maximum indicated under 'units sold', without affecting their future demands.

	Division A		**Division B**	
	External Market (normal sales)	**(Special Sales)**	**External Market (normal sales)**	
Selling Price (₹/u)	1,000	800	4,000	
Variable manufacturing cost (₹/u)	600	600	1,500*	(*excluding Component C)
Variable selling cost (₹/u)	100**	–	200**	(**Not incurred on inter division transfers)
Total variable cost (₹/unit)	700	600	1,700 *	(*excluding component C)
Contribution (₹/unit)	300	200	200	
Units Sold	1,250	750	900	
Production capacity	2,000 units		900 units.	

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For the next period, A requires for its own use in its selling outlets, 50 units of billing machines produced by B. B's manager proposes as follows:

Option I – B will supply 50 machines to A on its variable manufacturing cost basis provided A supplies to B, 500 units of Component C at A's variable manufacturing cost basis.

Option II – Both A and B resort to total variable cost per unit basis applicable to normal external sale, though neither A nor B incurs any selling cost on inter division transfers. A will be given 50 machines for its use. A will have to supply B all the 900 units that B requires.

Option III – Both A and B use the external market selling price (i.e. 1,000 and 4,000 ₹/unit for 900 units of Component 'C' and 50 machines respectively).

From a financial perspective, advise Division A's manager what he should choose. Support your advice with relevant figures.

What is the change in the rate of discount per unit given by B to A (based on unit transfer price to market price ratio) from option I to option II ?

(Note : Students need not work out the total cost statements. Steps showing relevant figures for evaluation are sufficient).

(b) The standard set for a chemical mixture of a company is as under :   6

Material	Standard Mix (%)	Standard Price ₹/ kg
A	80	50
B	20	100

Standard yield in production is 75 %.

The actual quantity produced was 1800 kg of output from the following :

Material	Quantity (kg)	Actual price
A	1400	60
B	600	90

Calculate the total material price, mix and yield variances, indicating whether they are favourable (F) or adverse (A or U).

3. (a) A company is operating at 60 % of its capacity with a turnover of ₹ 43.20 lacs.   **8**
         If the company works at 100 % capacity, the sales-cost relation is :

         Factory cost is two thirds of sales value. Prime cost is 75 % of factory cost.
         Administration and selling expenses (75 % variable) are 20 % of the sales
         value. Factory overhead will vary according to operating capacity as given
         below :

Operating capacity (%)	60	80	100	120
Factory overheads (₹ In lacs)	9.90	10.80	12	15

         The company has planned to operate at 80 % of its capacity. Moreover, it has
         received an export order and its execution will involve 40 % of the capacity.
         The prime cost of the order is estimated at ₹ 6.0 lacs and the shipping involved
         will be around ₹ 1.0 lac. Administration and selling expenses will be avoided
         on the export order. Taking the same percentage of profits as on the domestic
         sales, determine the minimum price to be quoted for the export order.

    (b) In a transportation problem for cost minimization, there are 4 rows indicating   **3**
         quantities demanded and this totals up to 1,200 units. There are 4 columns
         giving quantities supplied. This totals up to 1,400 units. What is the condition
         for a solution to be degenerate ?

    (c) State with a brief reason whether you would recommend an activity based   **5**
         system of costing in each of the following independent situations :

         (i)   Company K produces one product. The overhead costs mainly consist of
               depreciation.

         (ii) Company L produces 5 different products using different production
               facilities.

         (iii) A consultancy firm consisting of lawyers, accountants and computer
               engineers provides management consultancy services to clients.

         (iv) Company S produces two different labour intensive products. The
               contribution per unit in both products is very high. The BEP is very low.
               All the work is carried on efficiently to meet the target costs.

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4. (a) Ezee Ltd makes two products, E and Z. All units produced are sold. There is no   **8**
inventory build up. Production facilities may be used interchangeably for both
the products. Sales units are the limiting factor. The following information is
given :

	Present Level			Proposed increase
	E	Z	Total	Total
Contribution ₹/unit	25	20		
Fixed Cost ₹			46,000	47,500
Sales units (nos)	3,000	2,000	5,000	4,000

For increase in quantities above 4,000 units for each product, there will be an
increase in variable selling costs, (for the increased portion only), thereby
reducing the contribution per unit to the following figures :

Units	Contribution per unit (₹)	
	E	Z
4001- 5000	20	15
5001- 6000	15	10
Above 6000	No sales possible.	

(i) For the present level, find the break-even point with the present product
mix.

(ii) What is the minimum number of incremental units to be sold to recover
the additional fixed cost of ₹ 47,500 to be incurred ? (Present product mix
need not be maintained) :

(iii) If you are allowed to choose the best product mix for the incremental
level, (while taking the present mix given in the first table above for the
present level), what would be the individual product quantities and the
corresponding total contributions, the total average contribution per unit
and the total profits for the complete production?

(b) The following linear program is presented to you :   **8**

Objective : Maximize $Z = 30x + 45y$

Subject to: (i) $2x + 3y \le 1440$

(ii) $9x + 12y \ge 2160$

(iii) $3x + 4y \ge 1080$

(iv) $x, y \ge 0.$

You are required to draw the graph taking quantities of x and y in the respective axes in steps of 60 units (scale 1 cm. = 60 units), determine the optimality and offer your comments on the solution and the constraints.

5. (a) A machine manufacturing company needs four components A, B, C and D.   **8**
The components may be procured from outside. The cost, market price for the components and other information are given below :

Number of units required	3,000	3,500	2,000	3,000
	Figs. ₹ per unit.			
	A	B	C	D
Direct Material	120	140	150	120
Direct Wages	60	80	120	80
Direct expenses at ₹ 40 per machine hour	80	60	80	80
Fixed Cost	40	40	30	50
Total Cost	300	320	380	330
Market Price	300	320	400	270

There are constraints on the machine time in manufacturing all the components. Total machine hours available is only 12,000 hours.

It is possible to use the machine time in a second shift which will attract 20 % extra wages and other fixed overheads at ₹ 6,000 for every 1,000 hours or part thereof.

With relevant supporting figures, advise the best course of action to maximize the profits.

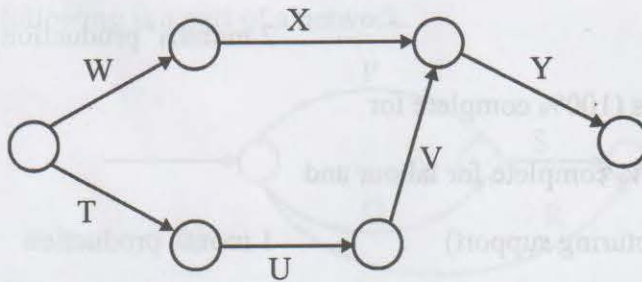(Note : Students need not work out the complete profitability statement).

(b) The following network and table are presented to you :   8

Activity	Normal Duration (Days)	Normal Cost (₹)	Crash Duration (Days)	Crash Cost (₹)
T	8	2,250	6	2,750
U	16	1,875	11	2,750
V	14	2,250	9	3,000
W	12	3,000	9	3,750
X	15	1,000	14	2,500
Y	10	2,500	8	2,860

Perform step by step crashing and reduce the project duration by 11 days while minimizing the crashing cost. What would be the cost of the crashing exercise ?

6. (a) PQR Ltd is considering introducing a new product at a price of ₹ 105 per unit.   8

PQR Ltd's controller has complied the following incremental cost information based on an estimate of 1,20,000 units of sales annually for the new product :

Direct material cost	₹ 36,00,000
Direct Labour cost	₹ 24,00,000
Flexible manufacturing support	₹ 12,00,000
Sales commission	10% of sales
Capacity-related cost	₹ 20,00,000

MCQ

Marks

The average inventory levels for the new product are estimated as follows :

Raw materials :   2 months' production

Work-in-progress (100% complete for

Materials and 50% complete for labour and

Flexible manufacturing support)   1 month production

Finished goods   2 months' production

Annual inventory carrying costs not included in the flexible manufacturing support listed earlier are estimated to be 12% of inventory value. In addition, the sales manager expects the introduction of new product to result in a reduction in sales of existing product from 3,00,000 to 2,40,000 units. The contribution margin for the existing product is ₹ 20 per unit.

Prepare a statement showing the budgeted impact on PQR's profits on the introduction of the new product. Should the new product be introduced?

(b)   Explain the features of a balanced score card.   **4**

(c)   Classify the following items under the more appropriate category :   **4**

Category (CC) – Cost Control Or Category (CR) – Cost Reduction.

(i)   Costs exceeding budgets or standards are investigated.

(ii)   Preventive function

(iii)   Corrective function

(iv)   Measures to standardize for increasing productivity

(v)   Provision of proper storage facilities for materials.

(vi)   Continuous comparison of actual with the standards set.
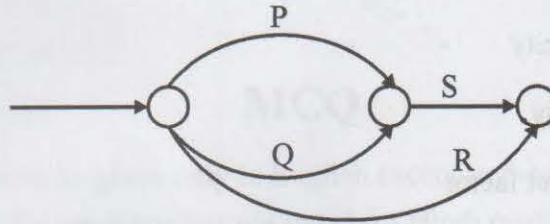
(vii)   Challenges the standards set

(viii) Value analysis

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7.   Answer any **four** out of the following **five** questions :

(a)   The following is a part of a network.   4

What are activities P and Q called? How would you rectify the situation ?

(b)   The following matrix was obtained after performing row minimum operations   4
on rows R_1 and R_2 in an assignment problem for minimization. Entries "xx"
represent some positive numbers. (It is not meant that all "xx" numbers are
equal). State two circumstances under which an optimal solution is obtained
just after the row minimum and column minimum operations.

(Candidates may use cell references as C_iR_j for uniformity. e.g. C_1R_1
represents the cell at the intersection of Column 1 (C_1) and Row 1 (R_1), etc.)

	C_1	C_2	C_3
R_1	0	xx	xx
R_2	xx	0	xx
R_3	xx	xx	xx

(c)   A refreshment centre in a railway station has two counters - (i) self-service   4
(opted by 60 % of the customers) and (ii) attended service (opted by 40 % of
the customers). Both counters can serve one person at a time. The arrival rate
of customers is given by the following probability distribution :

No. of arrivals	1	3	4	0	2
Probability	0.10	0.30	0.05	0.20	0.35

Formulate the associated interval of 2 digit random numbers for generating

(i)   the type of service and

(ii)   the arrival rate

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(d) Define the following : —

(i) maximum capacity (theoretical capacity)

(ii) practical capacity

(iii) normal capacity

(iv) principal budget factor

(The first three relate to a manufacturing plant)

(e) Suggest suitable cost units for the following services :

(i) Hospital

(ii) Hotel

(iii) Transport

(iv) Staff canteen

4